REMARKS

Claims 1-6 and 1-31 are pending in the present application. Claims 1, 11-12, 19, 25-31 were amended, and claims 7-10 and 32 were cancelled. Reconsideration of the claims is respectfully requested.

Amendments were made to the specification to correct errors and to clarify the specification. The amendment made to the specification was based on language and features disclosed in the claims as originally filed. No new matter has been added by any of the amendments to the specification.

Applicants thank the examiner for the telephone conference on March 6, 2003. The examiner approved the proposed amendments as overcoming the first paragraph rejection. Further, the examiner agreed that the amendment to independent claim 1 and similar claims warranted further review with respect to *Noorbakhsh*.

I. 35 U.S.C. § 112, First Paragraph

The examiner has rejected claims 7-11, 25-29, and 31-32 under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. This rejection is respectfully traversed.

In rejecting the claims, the examiner stated that the specification failed to describe a feature of collecting a set of input operations into a batch of input operations substantially equal to a number of rasters in a video display. The examiner has made similar rejections to features with respect to output operations.

In response to this rejection, applications have amended the Specification to include a discussion of these features. Such an amendment is proper because the features recited in these claims were present in the application as originally filed. Therefore, these features are considered to have been disclosed at the time that the application was filed. Claims 7-10 and 32 were cancelled. Further, claims 11, 25-29, and 31 were amended to remove the substantially equal feature and recite that video accesses are collected into batches of input and output operations for each line. Such feature is recited in the Specification on page 17, lines 2-10.

Therefore, the objection of the specification under 35 U.S.C. § 112, first paragraph has been overcome.

II. 35 U.S.C. § 103, Obviousness

The examiner has rejected claims 1-32 under 35 U.S.C. § 103 as being unpatentable over Noorbakhsh, U.S. Patent Number 5, 699,498 (*Noorbakhsh*). This rejection is respectfully traversed.

In rejecting the claims, the examiner pointed to *Noorbakhsh* as teaching a BitBLT operation including steps of reading data from a source memory area and data from a destination memory area, logically combining the data respectfully read from the source memory area and the destination memory area using the number of logical operations referred to as raster operations, and writing the results of the logical operations into the destination memory area.

In response to this rejection, claim 1 was amended to read as follows:

> 1. (Twice Amended) A method in a data processing system for performing a raster operation of graphics data, wherein the data processing system includes a system memory and a video memory, wherein the system memory and the video memory are connected by a bus and wherein the graphics data is organized into picture elements, the method comprising the data processing system implemented steps of:
>
> selecting a first plurality of picture elements from the system memory;
>
> selecting a second plurality of picture elements from the video memory, wherein the first plurality of picture elements and the second plurality of picture elements are selected such that changes in a direction of data on the bus are minimized when performing raster operations on the first plurality of picture elements and the second plurality of picture elements;
>
> reading the first plurality of picture elements from the system memory;
>
> reading the second plurality of picture elements from the video memory;
>
> performing a raster operation on a picture element from the first plurality of picture elements and a picture element from the second plurality of picture elements to form a processed picture element;
>
> writing the processed picture element to the video memory; and

repeating the performing and writing steps for each picture element in the first plurality of picture elements and the second plurality of picture elements until all picture elements have been processed, wherein changes in the direction of data on the bus are minimized between the reading and writing of picture elements.

As amended, claim 1 recites that the raster operation is performed on a picture element from the first plurality of the picture elements and the second plurality of picture elements to form a processed picture element. This processed picture element is then sent to the video memory. These steps are repeated for each picture element until all of the picture elements have been processed to minimize changes in the direction of data on the bus between reading and writing of picture elements.

These features are not shown or suggested in *Noorbakhsh* because this reference, as interpreted by the examiner, suggests moving data as a block transfer, rather than one pixel at a time, as recited in claim 1. Independent claims 12, 19, and 30 include similar features in their amended form. Therefore, these claims are patentable over the cited reference. The dependent claims depending from these independent claims also are patentable for the same reasons. Further, these claims include other features not taught or suggested by *Noorbakhsh*.

Claims 7-10 and 32 were cancelled. Further, with respect to claims 11, 26-29, and 31, these amended claims collect memory accesses of video data into batches of input and output operations for each line. Each batch of operations is sent to the video bus in a single operation such that delays encountered by waiting for the video bus to change directions is minimized. This feature is not shown or suggested in the cited reference. Therefore, these claims also are patentable over *Noorbakhsh*.

Therefore, the rejection of claims 1-32 under 35 U.S.C. § 103 has been overcome.

III. Conclusion

It is respectfully urged that the subject application is patentable over *Noorbakhsh* and is now in condition for allowance.

The examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

DATE: March 10, 2003

Respectfully submitted,

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APPENDIX

REDACTED PORTIONS OF THE SPECIFICATION:

Specification, Page 16, Line 27 – Page 17, Line 10

Therefore, the present invention provides an improved method, apparatus, and instructions for performing raster operations, which avoid the severe performance problems experienced with the overhead of repeatedly switching the video bus from input to output and back. The present invention provides this advantage through video accesses being grouped into batches of entirely input or entirely output operations. As a result, the number of delays encountered by waiting for the bus to change directions is minimized. By batching the input and output on each line, video performance may be doubled. Although the example in **Figure 7** shows the batching of reads, the same mechanism may be performed for the batching of writes. The input operations and output operations may be collected into batches of input operations and output operations in which these operations are substantially equal to the number of rasters in a video display.

REDACTED CLAIMS:

1. (Twice Amended) A method in a data processing system for performing a raster operation of graphics data, wherein the data processing system includes a system memory and a video memory, wherein the system memory and the video memory are connected by a bus and wherein the graphics data is organized into picture elements, the method comprising the data processing system implemented steps of:

selecting a first plurality of picture elements from the system memory;

selecting a second plurality of picture elements from the video memory, wherein the first plurality of picture elements and the second plurality of picture elements are selected such that changes in a direction of data on the bus are minimized when performing raster operations on the first plurality of picture elements and the second plurality of picture elements;

reading the first plurality of picture elements from the system memory;

reading the second plurality of picture elements from the video memory;

performing a raster operation on a picture element from the first plurality of picture elements and a picture element from the second plurality of picture elements to form a [plurality of] processed picture element[s]; [and]

writing the [plurality of] processed picture element[s] to the video memory; and

repeating the performing and writing steps for each picture element in the first plurality of picture elements and the second plurality of picture elements until all picture elements have been processed, wherein changes in the direction of data on the bus are minimized between the reading and writing of picture elements.

11. (Once Amended) A method for performing raster operations in a graphics system, wherein the method comprises the data processing system implemented steps of:

collecting memory accesses of video data [a set of output operations] into [a] batches of input operations and output operations [substantially equal to a number of rasters in a video display] for each line; and

sending each [the set] batch of [output] operations on a video bus in a single operation, wherein delays encountered by waiting for the video bus to change directions is minimized.

12. (Twice Amended) A data processing system comprising:

a bus;

a system memory connected the bus, wherein a first plurality of graphics elements are located within the system memory;

a video memory connected to the bus, wherein a second plurality of graphics elements are located within the video memory;

a processor unit connected to the bus, wherein the processor unit executes instructions to select a first plurality of picture elements from the system memory; select a second plurality of picture elements from the video memory in which the first plurality of picture elements and the second plurality of picture elements are selected such that changes in a direction of data on the bus are minimized when performing raster operations on the first plurality of picture elements and the second plurality of picture elements; read the first plurality of picture elements from the system memory; read the second plurality of picture elements from the video memory; perform a raster operation on a picture element from the first plurality of picture elements and a picture element from the second plurality of picture elements to form a [plurality of] processed picture element[s]; [and] write the [plurality of] processed picture element[s] to the video memory; and repeat performing and writing for each picture element in the first plurality of picture elements and the second plurality of picture elements until all picture elements have been processed, in which changes in the direction of data on the bus are minimized between the reading and writing of picture elements.

19. (Twice Amended) A data processing system for performing a raster operation of graphics data, wherein the data processing system includes a system memory and a video memory, wherein the system memory and the video memory are connected by a bus and wherein the graphics data is organized into picture elements, the data processing system comprising:

first selecting means for selecting a first plurality of picture elements from the system memory;

second selecting means for selecting a second plurality of picture elements from the video memory, wherein the first plurality of picture elements and the second plurality of picture elements are selected such that changes in a direction of data on the bus are minimized when performing raster operations on the first plurality of picture elements and the second plurality of picture elements;

reading means for reading the first plurality of picture elements from the system memory;

reading means for reading the second plurality of picture elements from the video memory;

performing means for performing a raster operation on a picture element in the first plurality of picture elements and a picture element in the second plurality of picture elements to form a [plurality of] processed picture element[s]; [and]

writing means for writing the plurality of processed picture elements to the video memory; and

repeating initiate of the performing means and writing means for each picture element in the first plurality of picture elements and the second plurality of picture element until all picture elements have been processed, wherein changes in the direction of data on the bus are minimized between the reading and writing of picture elements.

25. (Once Amended) A data processing system for performing raster operations in a graphics system, wherein the data processing system comprises:

collecting means for collecting memory accesses of video data into batches [a set] of input operations [into a batch of input operations] substantially equal to a number of rasters in a video display; and

sending means for sending each batch[the set] of input operations on a video bus in a single operation, wherein delays encountered in waiting for the video bus to change directions is minimized.

26. (Once Amended) The data processing system of claim 25 further comprising:

collecting means for collecting memory accessed of video data [a set of output operations] into [a] batches of output operations substantially equal to a number of rasters in a video display; and

sending means for sending each batch [the set] of output operations on a video bus in a single operation.

27. (Once Amended) The data processing system of claim 25, wherein the batches [set] of input operations are sent to a system memory connected to a video bus.

28. The data processing system of claim 25, wherein the [set] batches of output operations are sent to a video memory connected to a video bus.

29. A data processing system for performing raster operations in a graphics system, wherein the data processing system comprises:

collecting means for collecting video accesses [a set of output operations] into [a] batches of input operations and output operations [substantially equal to a number of rasters in a video display] for each line; and

sending means for sending each batch [the set] of output operations on a video bus in a single operation, wherein delays encountered by waiting for the video bus to change directions is minimized.

30. (Twice Amended) A computer program product in a computer readable medium for performing a raster operation of graphics data, wherein the data processing system includes a system memory and a video memory, wherein the system memory and the video memory are connected by a bus and wherein the graphics data is organized into picture elements, the computer program product comprising:

first instructions for selecting a first plurality of picture elements from the system memory;

second instructions for selecting a second plurality of picture elements from the video memory, wherein the first plurality of picture elements and the second plurality of picture elements are selected such that changes in a direction of data on the bus are minimized when performing raster operations on the first plurality of picture elements and the second plurality of picture elements;

third instructions for reading the first of a first plurality of picture elements from the system memory;

fourth instructions for reading the second plurality of picture elements from the video memory;

fifth instructions for performing a raster operation on a picture element in the first plurality of picture elements and a picture element in the second plurality of picture elements to form a [plurality of] processed picture element[s]; [and]

sixth instructions for writing the [plurality of] processed picture element[s] to the video memory; and

seventh instructions for initiating the fifth instructions and sixth instructions for each picture element in the first plurality of picture elements and the second plurality of picture elements until all picture elements have been processed, wherein changes in the direction of data on the bus are minimized between the reading and writing of picture elements.

31. A computer program product in a computer readable medium for performing raster operations in a graphics system, wherein the computer program product comprises:

first instructions for collecting memory accesses of video data [a set of input operations] into [a] batches of input operations substantially equal to a number of rasters in a video display; and

second instructions for sending each batch [the set] of input operations on a video bus in a single operation, wherein delays encountered waiting for the video bus to change directions is minimized.